Dryden Flight Research Center
P.O. Box 273
Edwards, California 93523-0273

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DRYDEN CENTERWIDE PROCEDURE

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HEARING CONSERVATION

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1.0 INTRODUCTION

1.1 Purpose

This Centerwide Procedure (DCP) establishes training, audiometric testing requirements, and procedures for maintaining the DFRC Hearing Conservation Program.

1.2 Applicability

This DCP is applicable to all DFRC employees including on-site and off-site contractors, and experimenters, who may be exposed to excessive noise levels.

1.3 Scope

The DFRC Hearing Conservation Program includes:

- Implementing noise reducing engineering and administrative controls.
- Identification of exposed personnel through noise monitoring.
- Use of hearing protection.
- Audiometric testing.
- Training.

2.0 APPLICABLE DOCUMENTS

2.1 Authority Documents

29 CFR 1910.95, Occupational Noise Exposure: This OSHA document sets the minimum requirements for a Hearing Conservation Program.

American Conference of Government Industrial Hygienist (ACGIH) Threshold Limit Values (TLV®) and Biological Exposure Indices (BEI®). ACGIH sets the noise exposure limit for 8 hours at 85 dBA. These TLV® and BEI® are incorporated by reference at DFRC.

NHS/IH 1845.4, NASA Occupational Safety and Health Programs. This NASA Standard sets measurement and monitoring requirements for the NASA Hearing Conservation Program.

NPD 8710.2B, NASA SAFETY AND HEALTH PROGRAM POLICY. This NPD establishes the authority of the NASA Hearing Conservation Program.

2.2 Guideline Documents

NHB 1700 1 (V1-B); NASA SAFETY POLICY AND REQUIREMENTS DOCUMENT. This document is a basic safety manual which establishes general NASA safety policies and requirements.

NHB 2710.1; SAFETY AND HEALTH HANDBOOK- OCCUPATIONAL SAFETY AND HEALTH PROGRAMS.

ANSI S1.4; Specifications for Sound Level Meters.

ANSI S1.25; Specification for Personal Noise Dosimeters.

ANSI S3.6; Specifications for Audiometers

ANSI S1.13; Measurement of Sound Pressure Levels in Air.

3.0 DEFINITIONS

3.1 Action Level: An exposure to an 8-hour time-weighted-average (TWA) at 82 decibels measured with a dosimeter or sound-level meter on the A-scale at slow response; or equivalently, a dose of 50 percent. The Action Level is the criterion for instituting noise survey and employee participation in the medical monitoring program.

3.2 Administrative Controls: Controls such as change of work station or work schedule.

3.3 Audiogram: A graph showing the results of an audiometric test.

3.4 Audiologist: A trained and certified person who performs audiometric testing.

3.5 Audiometer: The instrument used to measure a persons hearing response.

3.6 Baseline Audiogram: The earliest audiogram that is used to compare subsequent audiograms for changes.

3.7 Continuous Noise: Noise sources cycles at greater than one cycle per second or 60 cycles per minute.

3.8 Decibel (dB) A unit of energy used to measure noise or sound.

3.9 dBA: A unit of energy used to measure noise or sound by an A-weighted scale at slow response programmed into a sound level meter.

3.10 Engineering Controls: Any mechanical device, physical barrier, enclosure, feature, or other design that reduces the sound level at the source of noise generation or along the path of the noise to the individual. Examples:

- The placement of noise generating equipment away from workstations.
- Placing barriers between workstations and the noise.
- Building or placing noise attenuation around noise producers.
- Design or purchase equipment that produces less noise.

3.11 Hertz (Hz): Measurement of frequency in cycles per second.

3.12 Impact Noise: Noise peaks with intervals of greater than one second. If noise peaks are less than one second the noise is considered continuous.

3.13 Noise: An unwanted sound.

3.14 Noise Dose: Cumulative noise measured by intensity (dBA) and time.

3.15 Noise Hazard Area: Any area at DFRC that produces continuous noise of 85 dBA or greater. Noise hazard areas must be posted with warning signs.

3.16 Standard Threshold Shift: A change in the hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2,000, 3,000, and 4,000 Hz in either ear.

3.17 Time Weighted Average: The time-weighted average noise exposure for a conventional 8-hour workday and a 40 hour work week.

4.0 ROLES and RESPONSIBILITIES

4.1 Overview

The chain of responsibility for ensuring that there is a safe work environment at DFRC that follows required safety standards, regulations, codes, and guidelines starts with the Center Director and flows downward through management to supervisors. In addition, each person who works at DFRC must understand that a "condition of employment" is to observe all safety specifications applicable to the task being performed.

4.2 Directorates and Single Letter Offices

Directorates and Single Letter Offices shall take engineering and administrative actions to keep noise levels below the Action Level within their areas of responsibility, where possible.

4.3 Program and Project Managers

Program and Project Managers shall ensure that, where feasible, a consideration in the design and development of facilities or purchase of equipment will be to minimize noise exposure hazards.

4.4 Safety, Health, and Environmental Office

4.4.1 The Chief, Safety, Health, and Environmental Office has safety oversight for the DFRC Hearing Conservation Program.

4.4.2 Industrial Hygienists within the Safety Office are tasked with:

- Providing baseline surveys of each new operation, job or procedure having the potential of being at or above the noise Action Level.
- Monitoring of areas where noise is or has the potential to be at or above 82 dBA.
- Providing noise monitoring findings to individuals, supervisors, and site managers.
- Providing noise monitoring findings to include the names of persons exposed to the Action Level to the Health Unit Medical Officer.
- Recommending appropriate means of controlling noise exposure.
- Reviewing this document and operational plans to assess the adequacy of precautions taken to control noise exposure.
- Maintaining noise survey records in accordance with 29 CFR 1910.95 (m) and making these records available to employees.

4.5 Health Unit Medical Officer

The Health Unit Medical Officer, or designated representative is responsible for:

- Reviewing occupational histories of persons in the Hearing Conservation Program and evaluating current audiogram results.

- Maintaining a registry of persons enrolled in the Hearing Conservation Program and scheduling those persons for annual audiometric testing.

- Informing employee and his/her supervisor of threshold shifts that require attention or action. Informing the employee of other medical pathology of the ear. Making a recommendation for further testing or the referral to a hearing specialist when an employee hearing test indicates the need.

- Notifying employer of permanent significant threshold shifts. If the situation so indicates, recommend reassignment of employee to low noise work area.

- Ensuring that persons who conduct audiometric testing have reviewed and understand the requirements of this document, have received required training, and satisfactorily demonstrated competence in administering automatic audiometric examinations to obtain valid audiograms.

- Ensuring that audiometric equipment is properly calibrated and ambient noise levels in the test rooms meet the requirements found in 29 CFR 1910.95, Appendix D, Maximum Allowable Octave-Band Sound Pressure Levels for Audiometric Test Rooms.

- Informing persons scheduled for audiometric testing to avoid noise over 80 db for 14 hours prior to the test. Provide hearing protectors for these persons if needed to meet the 14 hour requirement.

- Doing a final audiogram prior to an employee's termination or retirement when the employee is in the Hearing Conservation Program. This final audiogram will be made part of the employee's medical record and maintained in accordance with NPD 1441.1, 127 [1800] (N-11-4) (b).

- Ensuring that employees have access to their hearing records.

- Providing annual Hearing Conservation Training in accordance with 29 CFR 1910.95 (k).

4.6 Supervisors

Supervisors are responsible for:

- Ensuring that each worker enrolled in the Hearing Conservation Program follows the requirement of the program, i.e. receives an annual hearing test and uses proper hearing protection equipment when necessary.

- Reporting suspected noise hazards in their area of jurisdiction to the Safety Office Industrial Hygienist.

- Supplying the Safety Office Industrial Hygienist with the names of persons under their supervision that work in designated hazardous noise areas and ensure that these persons receive training and hearing protection equipment as required.

- Referring persons who complain of hearing loss to the Health Unit for evaluation.

- Enforcing the wearing of hearing protection devices and developing administrative controls to limit hazardous noise exposure where possible.

- Notifying the Industrial Hygienist of any changes to the noise levels in his/her area of jurisdiction such as the addition or removal of noise generating equipment.

- Ensuring that hazardous noise signs are posted at appropriate locations.

- Ensuring that employees who are in the Hearing Conservation Program receive a final audiogram prior to termination or retirement.

4.7 Employees Responsibilities

Employees in the Hearing Conservation Program are responsible for:

- Following the instructions in this document including wearing and maintaining hearing protection equipment when required.

- Cooperating with supervisors, medical, and safety personnel to prevent hearing loss caused by workplace noise.

- Notifying supervisor of suspected hearing loss.

- Notifying supervisor of equipment or operations that may be out of limits for noise exposure.

5.0 NOISE CONTROLS

5.1 General

Copies of the DFRC Hearing Conservation Program and any appropriate records required by this document or 29 CFR 1910.95 will be provided, on request, to employees, former employees or their representatives, government agencies, and individuals authorized to receive such documents.

5.2 Hearing Conservation Program Enrollment

Enrollment in the DFRC Hearing Conservation Program is required when an employee is exposed to a noise dose in excess of 50 percent of the permissible exposure limits listed in Table 1, or impulse noise at or in excess of the limits listed in Table 2.

5.3 Engineering Controls

Where feasible, facilities and equipment will be procured, designed, operated, or modified to prevent employee exposure to continuous noise above 85 dBA. The reduction of noise levels, even if not above 85 dBA, is important. When engineering controls fail to lower the noise level below those listed in Table 1 and 2, administrative actions must be taken and/or hearing protection equipment used.

5.4 Personal Hearing Protection

- Ear muffs and/or ear plugs will be provided to employees assigned to work in areas where they will be exposed to continuous noise in excess of 82 dBA without regard to duration of exposure and when working in areas where they will be exposed to impulse noise in excess of 140 dBA. For sanitary purposes, ear muffs and ear plugs will not be shared.

- Hearing protectors must attenuate noise to 85 dBA or less. A combination of ear muffs and ear plugs are required where noise levels are 110 dBA or greater. For personnel who have experienced a Standard Threshold Shift (STS). Protectors must attenuate the

exposure to an 8-hour TWA of 82 dBA. The estimation of hearing protector attenuation should be performed in accordance with 29 CFR 1910.95, Appendix B. More effective hearing protectors shall be provided when current hearing protectors prove to be inadequate.

- When reusable, preformed earplugs are used they will be fitted to the individual by a trained medical professional. During fitting, the employee will be instructed in the proper method of insertion, and cleaning of the earplugs. The DFRC Health Unit provides this service.

- Type II earmuffs will be provided for employees when analysis of noise environments shows that the attenuation provided by earplugs is not sufficient to reduce noise exposure to or below the requirements of Tables 1 and 2. NASA flight line and flight project personnel may obtain earmuffs from the Life Support Section.

- Sound-suppression headsets may be used in hazardous noise areas. These headsets will be issued by Life Support Section on an as needed basis.

5.5 Administrative Control

Administrative controls shall be used, whenever possible, to restrict the number of persons and their exposure time to hazardous noise. Exposure levels will not exceed those listed in Tables 1 and 2.

5.6 Monitoring

5.6.1 Sound level measurements will be conducted when information, observation, or calculation shows that an employee may be exposed to a noise level in excess of 82 dBA TWA. These measurements should include monitoring to determine representative noise levels, to evaluate employee complaints, or where normal conversation is difficult to hear when the two people are face to face two feet apart. When initial determination shows that any employee/s (without hearing protection) may be exposed to noise at or above the action level, noise monitoring will be conducted to determine the noise dose of the exposed employee/s. If the noise level is above the Action Level the first corrective action will be to determine appropriate and feasible noise abatement actions that may be implemented to bring the noise within limits.

5.6.2 The results of noise dosimetry and monitoring will be made in writing to employees or their representative for exposures above the Action Level.

5.6.3 Both noise dosimetry and area monitoring will be repeated when noise levels are found to be above the Action Level, or whenever changes to facilities, equipment, work practices, procedures, or noise control measures alter noise exposure.

5.6.4 New equipment or operations that have the potential for creating hazardous noise should be measured before the equipment or operation is put online.

5.6.5 The locations of continuous, intermittent, and impulsive sound levels from 80 dBA shall be measured and integrated into a noise data base by the Safety Office Industrial Hygienist.

6.0 METHODS OF MEASUREMENT

6.1 Sound-Level Meters

As a minimum, sound level meters will meet the Type II requirements of ANSI S1.4, Specifications for Sound Level Meters, and will be capable of measuring sound in the 80-130 dBA range. Measurements will be made in accordance with ANSI S1.13, Measurement of Sound Pressure Levels in Air.

6.2 Noise Dosimeters

Noise dosimeters shall meet the Class 2A-90/80-5 requirements of ANSI S1.25, Specifications for Personal Noise Dosimeters, and will be capable of integrating sound levels of 80 dBA and above.

7.0 HEARING CONSERVATION PROGRAM

7.1 Medical Requirements

7.1.1 Employees enrolled in the Hearing Conservation Program shall receive a medical evaluation prior to the assignment of duties involving exposure at or above the Action Level. The medical examinations will include a baseline audiogram, a determination of any preexisting medical pathology of the ear, and a work history to document past noise exposure.

7.1.2 A medical examination will be conducted within 30 days when one cannot be obtained prior to placement in a job with noise levels at or above the action level or when it is discovered that an employee is working in a noise environment at or above the action level.

7.1.3 Employees suffering from acute diseases of the ear should not be placed in hazardous noise areas until the condition has abated, particularly if the disease precludes the use of hearing protection.

7.1.4 Medical referral's are required when:

1. Average hearing threshold level at 500, 1000, and 2000 Hz are greater than 25 db.

2. Single frequency loss greater than 55 db at 3000 Hz or greater than 30 db at 500, 1000, or 2000 Hz.

3. Difference in average hearing threshold level between the better and poorer ear of more than 15 db at 500, 1000, and 2000 Hz; or of more than 30 db at 3000, 4000, and 6000 Hz.

4. Reduction in hearing threshold level in either ear from baseline or previous monitoring audiogram of more than 15 db at 500, 1000, or 2000 Hz; or of more than 30 db at 3000, 4000, or 6000 Hz.

5. Variable or inconsistent responses or unusual hearing loss curves.

7.1.5 Medical criteria for examination by a qualified physician is required if:

1. There is a presence and persistence of ear pain, drainage, dizziness, severe persistent tinnitus (sudden or fluctuating hearing impairment, and rapidly progressing hearing loss), a feeling of fullness or discomfort in one or both ears, or a history of these within the last 12 months.

2. An employee has previously received an otologic evaluation and the basis of failing on the above criteria, a reevaluation should be done if ear pain, drainage, dizziness, severe persistent tinnitus develops, or if a significant change in hearing levels is observed.

3. An employee suspects a medical pathology of the ear is caused or aggravated by the use of hearing protectors.

When an employee is referred to a physician specialist by the examining physician, relevant medical findings will be provided to the employee or his/her representative upon request.

7.1.6 When a STS is detected, a follow-up review will be conducted to include:

- Retraining of the employee by the Health Unit on the hazardous effects of noise and the need to use hearing protection. If possible, refitted with hearing protectors offering greater sound attenuation.

- When hearing protectors have not been previously used, the employee will be fitted by the Health Unit with hearing protectors and will be provided training in their use.

- The employee's work area will be investigated by a DFRC Industrial Hygienist to determine if work practices or changes in equipment or procedures have increased the noise hazard.

- In order to prevent further hearing loss, the physician may recommend that an employee who has experienced an STS be reassign to a low noise work area. Once this recommendation is made by the physician it becomes the responsibility of Human Resources and the individual's supervisor to make the reassignment. The employee will continue in the Hearing Conservation Program after reassignment.

7.2 Audiograms

7.2.1 Employees enrolled in the Hearing Conservation Program will receive an initial (baseline) audiogram followed by annual audiograms. Information on audiograms of employees enrolled in the Hearing Conservation Program will:

- Identify the level to which the audiometer was calibrated at the time of the testing and the date of last major calibration.
- Show the date of the audiogram.
- Show the examiners name.

- List the name and job title of the person being tested.
- Show the date of the employee's most recent noise exposure assessment.
- Show the date hearing training was received by the employee.

Audiograms will be rescheduled when employees have any apparent or suspected ear, nose, or throat problems that could compromise the validity of the audiogram. Employees shall be free of noises in excess of 80 dBA for 14 hours prior to receiving an audiogram. Hearing protectors may be used to limit exposure during this period.

Each new audiogram will be compared to the baseline audiogram by a physician or qualified person to determine the validity of the test and if there has been a standard threshold shift. A more current audiogram may be used as the baseline if, in the opinion of examining physician or qualified person, the hearing threshold indicates a significant improvement over the baseline audiogram. Allowance may be used for the contribution of aging to the hearing threshold level by adjusting the audiogram in accordance with 29 CFR 1910.95 Appendix F, Calculations and Application of Age Corrections to Audiograms.

7.2.2 When the evaluation of an audiogram indicates a standard threshold shift has occurred, the employee will be notified of the test results, in writing, within 21 days by the DFRC Health Unit. A retest shall be scheduled within 30 days in an effort to determine if the threshold shift is due to non-occupational causes. A permanent threshold shift will have occurred when confirmed by the retest.

7.2.3 Work related hearing loss and other pathologies such as those caused by wearing hearing protectors will be identified and written notification made by the Health Unit to the Safety Office, Human Resource, Management, and Development Office for civil service personnel, and to site managers for contractor personnel.

7.2.4 Employees who have been enrolled in the Hearing Conservation Program will receive a final audiogram prior to termination or retirement.

7.3 Audiometric Testing

7.3.1 Personnel who perform audiometric tests shall be under the supervision of an audiologist or physician. The operation of manual audiometers requires certification by the Council for Accreditation in Occupational Hearing Conservation. Audiometers shall be calibrated to the zero reference levels, meet the specifications, maintenance, and use requirements as specified by ANSI S3.6, Specifications for Audiometers.

7.3.2 Pure tone, air conducting testing shall be conducted at frequencies of 500, 1000, 2000, 3000, 4000, and 6000, Hz in each ear. Where a pulsed tone, self-recording audiometer is used, it shall also meet the requirements of 29 CFR 1910.95 Appendix C, Audiometric Measuring Instruments.

7.4 Audiometer Calibration

7.4.1 Audiometer shall be tested before the first test of the day by using an acoustical ear or testing an individual with a known, stable hearing baseline (a biological check). A record of daily checks will be maintained. Deviations of 5 db or more shall require an acoustical calibration test.

7.4.2 An acoustical calibration will be performed semi-annually for self-recording audiometers or whenever a functional check indicates a deviation of 5 db or more. Calibration checks will conform to the requirements of 29 CFR 1910.95 Appendix E, Acoustic Calibration of Audiometers.

7.4.3 An exhaustive calibration will be performed every 2 years and whenever an acoustical calibration test indicates a deviation of 10 db or greater. A tag will be placed on the front of the instrument showing the date of calibration and that the instrument was calibrated to the criteria of ANSI S3.6, Specifications for Audiometers.

7.4.4 Audiometric testing rooms shall be tested annually to determine compliance with background sound pressure levels as listed in 29 CFR 1910.95, Appendix D.

7.5 Caution Signs

Entrances to rooms and facilities that produce continuous noise of 85 dBA or greater will be posted with caution signs stating that hearing protection is required. Decals or placards with similar information will be affixed to

power tools and machines which produce continuous noise at or greater than 85 dBA at the operators position. Signs and decals shall have wording in black letters on yellow or orange background.

7.6 Training

7.6.1 Employees who are enrolled in the Hearing Conservation Program will receive annual training provided by the Health Unit. The training program shall include, as a minimum:

- An overview of the program.
- A review of the effects of noise on hearing.
- The purpose of hearing protection.
- The advantages, disadvantages, and attenuation characteristics of various types of protectors.
- An explanation of audiometer procedures and their purpose.

Personnel will be encouraged to use hearing protectors whenever they are exposed to noise during off-duty activities.

7.6.2 Supervisors of personnel participating in the Hearing Conservation Program will attend a one time hearing training course as listed in 7.6.1, above.

8.0 RECORDS

8.1 Audiograms and Noise Exposure Measurement Records.

Audiograms, pathological findings, and noise exposure measurement records of persons in the Hearing Conservation Program shall be maintained as a permanent part of the individual's medical records. If the exposure measurements were made of an areas and are representative of more than one employee, a record of the measurements will be placed in each individual's medical record. Medical records are maintained in accordance with NPD 1441.1, RECORD RETENTION SCHEDULES, Schedule 1, 127 [1800] (N 11-4).

8.2 Audiometric Test Rooms

Records of the measurement of the background sound pressure levels of audiometric test room will be maintained by the Health Unit in accordance with 29 CFR 1910.95 (m), Record Keeping.

8.3 Noise Surveys

Noise surveys will be maintained by Safety Office Industrial Hygienist. These records will be maintained in accordance with 29 CFR 1910.95 (m), Record Keeping.

TABLE 1
Permissible Exposure Limits for Continuous Noise

DURATION (Hours)	dBA
16	82
8	85
4	88
2	91
1	94
0.05	97
0.25	100
0.125 or less	103

TABLE 2
Permissible Exposure Limits for Impact or Impulse Noise

SOUND LEVEL (dBA) (peak sound pressure level)	Permitted Number of Impacts or Impulses per Day
140	100
130	1000
120	10000